

- (north of Mexico). Monog. 3, Acad. Nat. Sci. Philadelphia, 1 (1):i-xviii, 1-573.
- Smith, A. G. 1970. American Malacological Union symposium: Rare and endangered mollusks. 6. Western land snails. *Malacologia*, 10 (1):39-46.
- Valentine, J. W., and J. H. Lipps. 1967. Late Cenozoic history of the southern California islands. Pp. 21-35 in *Proceedings of the symposium on the biology of the California islands*. (R. N. Philbrick, ed.), Santa Barbara Botanic Garden, 363 pp.
- Weaver, D. W. 1969. Paleogeographic implications and geologic history. Pp. 115-124 in *Geology of the Northern Channel Islands*. (D. W. Weaver, ed.), Pac. Sect., Amer. Assoc. Petrol. Geol. and Soc. Econ. Paleontol. and Mineral., viii + 200 pp.
- Weaver, D. W., and D. P. Doerner. 1967. Western
- Anacapia—A summary of the Cenozoic history of the northern Channel Islands. Pp. 13-20 in *Proceedings of the symposium on the biology of the California islands*. (R. N. Philbrick, ed.), Santa Barbara Botanic Garden, 363 pp.
- Webb, G. R. 1941. A comparison of young *Helminthoglypta umbilicata* and *H. dupetithouarsi*. *Nautilus*, 54 (4):122-125.
- . 1952. Pulmonata, Helminthoglyptidae: Sexological data on the land snails, *Cepolis maynardi* & *Helminthoglypta traski fieldi* and their evolutionary significance. *Gastropodia*, 1 (1):4-5 (pages unnumbered).
- . 1954. The life history and sexual anatomy data on *Ashmunella* with a revision of the triodopsin snails. *Gastropodia*, 1 (2):11-18.
- Accepted for publication April 5, 1973.

A NEW GENUS AND SPECIES OF GECKO (SAURIA: GEKKONIDAE) FROM IRAN AND IRAQ

JAMES R. DIXON¹ AND STEVEN C. ANDERSON²

ABSTRACT: A thorough examination of the osteology of eastern hemisphere species of gekkonid lizards formerly placed in the genus *Phyllodactylus* indicates that these species either belong to generic taxa presently in the synonymy of *Phyllodactylus* or represent new genera. *Phyllodactylus elisae*, an isolated member of the eastern hemisphere "*Phyllodactylus*" found only in western Iran and eastern Iraq, represents one of the new genera. It differs from western hemisphere *Phyllodactylus* and the Old World forms by the absence of cloacal sacs and bones, loss of one phalanx in the fourth finger and toe, loss of the second epibranchial arch of the hyoid, and possession of a cartilaginous rod-shaped hypischium.

A new species is described from the northern Iraq-Iran border area, differing from *P. elisae* in size of body and tail tubercles and granules, absence of tubercles on upper arm and rear of head, larger snout-vent length, color, and color pattern.

For the past 15 years, one of us (Dixon) has been involved in a study of the eastern hemisphere species of the gekkonid genus *Phyllodactylus*. A thorough examination of the osteology of the eastern hemisphere species indicates that they are not *Phyllodactylus* (*sensu stricto*), but are either new genera or represent generic taxa presently in the synonymy of *Phyllodactylus*.

Dixon and Kluge (1964) described a new

genus (*Crenadactylus*) for the Australian species *Phyllodactylus ocellatus*, and Dixon and Kroll (in press) have recently resurrected the genus *Paroedura* Gunther, for nine species of *Phyllo-*

¹ Dept. Wildlife and Fisheries Sciences, Texas A and M University, College Station, Texas 77843.

² Callison College, University of the Pacific, Stockton, California 95204.

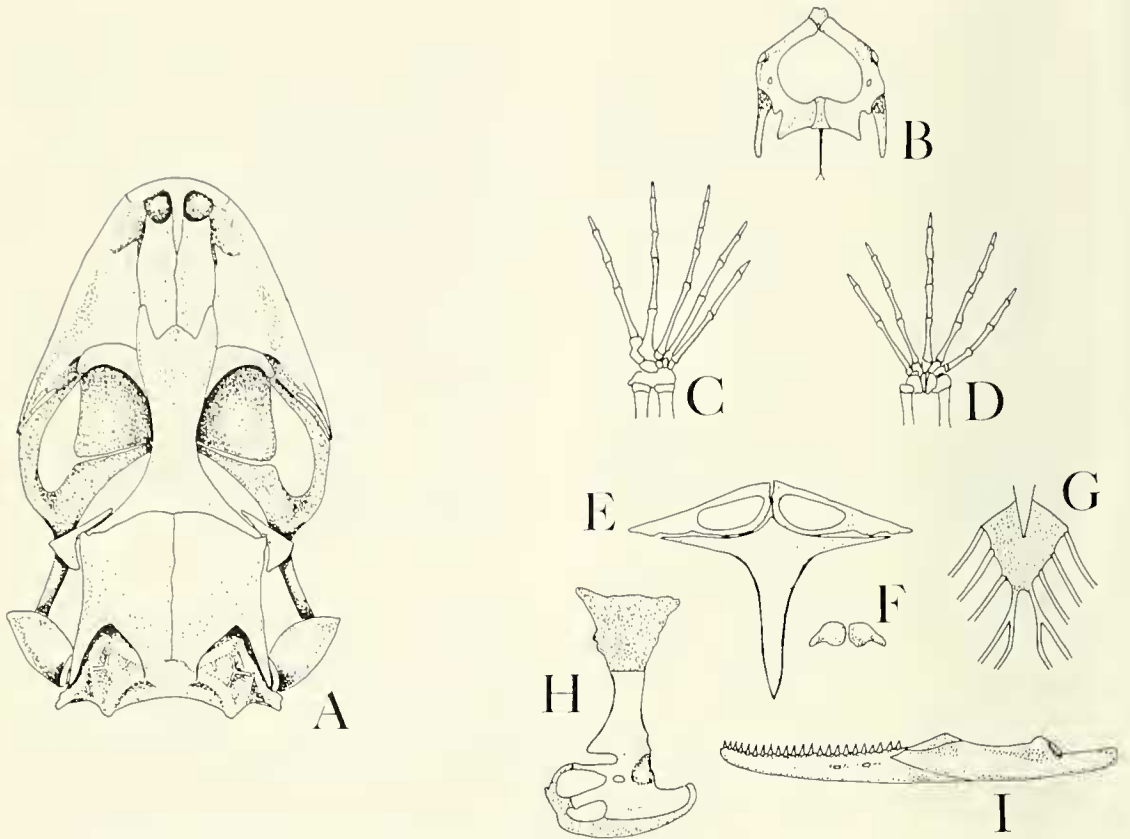


Figure 1. Some aspects of the osteology of the gekkonid lizard genus *Asaccus (elisae)*. (A) dorsal view of skull; (B) ventral view of pelvic girdle; (C) dorsal view of pes; (D) dorsal view of manus; (E) ventral view of clavicles and interclavicle; (F) dorsal view of paired atlas; (G) ventral view of sternum and sternal ribs; (H) lateral view of the scapulo-coracoid element; (I) lateral view of the left dentary.

dactylus from Madagascar. Manuscripts dealing with the remaining Australian, African, and Asian species of *Phyllodactylus* are in progress.

Phyllodactylus elisae, as currently recognized, was described by Werner (1895) from the ruin of Nineveh, near Mosul, Iraq. Nikolsky (1907) described *P. eugeniae* from Dezful, Iran, apparently not being aware of Werner's 1895 description of *elisae*. Werner (1917) pointed out the similarities between the two species and placed *eugeniae* in the synonymy of *elisae*. This action was verified by Wettstein (1951) and Wermuth (1965).

The external squamation of *P. elisae* is much like that of species from the western hemisphere and consists of enlarged tubercles arranged in longitudinal rows on the dorsum and tail, scattered randomly on the head and limbs, and one large pair of terminal, leaf-like lamellae on the

fingers and toes. However, the internal anatomy of *P. elisae* differs in several important features from species of the western and eastern hemisphere. One of these differences (absence of cloacal sacs and bones) was pointed out by Kluge (1967). We believe the magnitude of osteological and anatomical differences that separates *P. elisae* from other gekkonid genera warrants the erection of a new generic taxon. With reference to the absence of cloacal sacs, we propose the following name.

Asaccus, new genus

Type species: Phyllodactylus elisae Werner 1895.

Diagnosis: Asaccus differs from all other gekkonid genera in the following combination of characters: cloacal sacs and bones absent; second epibranchial arch of hyoid present; phalangeal formulae for manus and pes, 2-3-4-4-3; stapes perforate



Figure 2. *Asaccus grisonotus*, new species: (1) Palagawrah Cave, Sulaimaniyah Liwa, Iraq, c. 925 m. (type locality?); (2) 38.5 mi from Shahabad (direction not recorded), Kermanshah Province, Iran (type locality). *Asaccus elisae*: (3) Balad Sinjar, Mosul Liwa, Iraq, c. 770 m; (4) Nineveh, Mosul Liwa, Iraq (type locality); (5) Jarmo, Kirkuk Liwa, Iraq, c. 800 m; (6) Baghdad, Iraq; (7) Dezful, Khuzestan Province, Iran, c. 160 m (type locality for *Phyllodactylus eugeniae* Nikolsky); (8) Abu Karaniyeh, Khuzestan Province, Iran (type locality for *P. eugeniae*); (9) between Masjed Soleyman and Batvand, Khuzestan Province, Iran, c. 300 m; (10) Sar-i-Gach, Khuzestan Province, Iran, c. 450 m; (11) Pol-e Abginch, Fars Province, Iran, c. 950 m.

(stapedial foramen present); 28 amphicoelous, sacral and presacral vertebrae; atlas paired; parietals paired; nasals paired, with long projection of premaxillary between nasals; anterior tip of mesoscapula lacking osseous or cartilaginous connection with precoracoid process; interclavicle shield-like; 3 pairs of sternal ribs, 2 pairs of mesosternal ribs; one large fenestra in clavicle; supratemporal absent; angular absent; frontal single; 9–10 premaxillary teeth, 56–60 total dentary teeth and 48–52 total maxillary teeth; 14 scleral ossicles in each eye; hypoischium cartilaginous, rod-like (Fig. 1).

Distribution: *Asaccus* is known from eastern Iraq, east of the Euphrates River, and western Iran, west of the Zagros Mountains (Fig. 2). Arnolds (1972) described a new species from the southeastern tip of the Arabian Peninsula which he designated *Phyllodactylus gallagheri*. Although we have not examined specimens of this new taxa, we suspect that it is yet another representative of the genus *Asaccus* and

would therefore extend the range of the genus southward onto the Arabian Peninsula.

Asaccus elisae (Werner)

Phyllodactylus elisae Werner 1895. Verh. Zool.-bot. Ges. Wien, 45:14.

Type locality: Ruin of Nineveh, Iraq.

Phyllodactylus eugeniae Nikolsky 1907. Ann. Mus. Zool. St. Petersburg, p. 268. Type locality: Dezful and Abu-Garia, Iran.

Diagnosis: A moderately small gecko (maximum snout-vent length 57 mm avg. 50.2 mm), tubercles of dorsum, limbs, and tail large, length of individual tubercle more than 64 percent ($M = 67.5$ percent) of ear diameter; 8–14 longitudinal rows of enlarged dorsal tubercles; 10–12 large tubercles across rear of head between ears; 2–12 enlarged tubercles on upper arm, above elbow; tail tubercles arranged in whorls, each whorl separated by 3–4 rows of granules (Fig. 3):

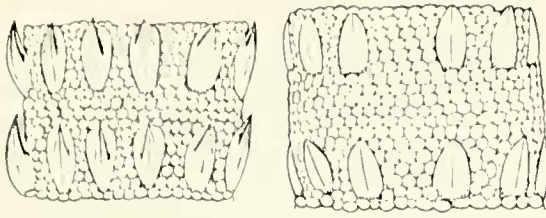


Figure 3. Dorsal view of the proximal whorls of tubercles about the tail. Note that the large tubercles on the right (*A. griseonotus*) are flattened and not strongly keeled, while those on the left (*A. elisae*) are elevated and strongly keeled. The dorsal body scales and tubercles are similar to those illustrated here.

each tubercle of dorsum separated from other such tubercles by 2–3 granules. Ground color usually dark brown with none to five dark brown, dorsal body bands; each tubercle usually tipped with white, giving freckled appearance to color pattern; tail with five brown to black bands and five white bands, each of equal width, venter whitish.

Remarks: In addition to *A. elisae*, a series of nine specimens, which represent a new species of *Asaccus*, were taken from Palegawra Cave, Iraq, and 38.5 mi from Shahabad, Iran (Fig. 2). Superficially, these individuals resemble *elisae* in most meristic characters. Without a detailed comparison of individuals of both populations, it would be extremely difficult for a person unfamiliar with gekkonid squamation to distinguish the two forms. A detailed analysis of the salient features of the new taxon reveals that some of the characters differ significantly from those of *elisae* at two and occasionally three, standard errors. However, the known range of variation of each of these characters matches or strongly overlaps that of *elisae*. In addition to the meristic data, however, there are other profound differences and, therefore, we consider the new taxon distinct from *elisae* and propose the following name.

Asaccus griseonotus, new species

Holotype: Field Museum of Natural History (FMNH) 170824; adult ♀, collected by Dan Womochel and Anthony F. De Blase, 29 August 1968, 38.5 mi from Shahabad, Kermanshah, Kerman Prov., Iran. *Paratypes:* FMNH 170817–23, topoparatypes; FMNH 74553, Palegawra Cave, Sulaimaniyah Liwe, Iraq.

Distribution: Known only from the type locality and Palegawra Cave, Iraq.

Diagnosis: A large member of the genus with a maximum snout-vent length of 71 mm (avg. 61.8 mm), lacking enlarged tubercles across the rear of head and on dorsal surface of upper arm; tubercles of dorsum and limbs small, length of individual tubercle less than 46 percent ($M = 39.4$ percent) of ear diameter; 6–7 rows of granules separate enlarged tubercular tail whorls (Fig. 3); each tubercle of dorsum separated from its adjacent tubercle by 4 to 5 granules; dorsal color ash gray with 20 to 30 small, dark gray spots scattered over dorsum.

Description of holotype: Rostral slightly more than twice as wide as high, its dorsal edge shaped in a broad "W"; two internasals, somewhat hexagonal, with rounded edges, their median edges in broad contact bordered posteriorly by three granules and postnasal of each side; nostril surrounded by rostral, labial, internasal and two postnasals; first labial in broad contact with lower edge of nostril; shallow depression between internasals, moderate depression in frontal region; 10 scales between eye and nostril; scales in posterior loreal region about five to six times larger than interorbital scales; 17 scales across snout at level of third labial; 18 scales across anterior edge of orbits; 20 interorbital scales; eye large, its diameter contained in snout length 1.9 times; eyelid with three rows of granules and one larger outer row, of which the last five to seven scales are pointed; diameter of ear contained in eye diameter 1.9 times; ear opening large, scales of anterior and posterior border granular, subequal; rear of head granular with a few larger, almost subequal scales intermixed; 9/9 supralabials and 7/7 infralabials to point below center of eye; mental bell-shaped, about as long as wide, bordered posteriorly by two postmentals; postmentals twice as long as wide, their median edges in broad contact, followed by second pair of subpostmentals that are followed by an undulating transverse row of 16 granules, followed by 20 granules in second row; postmentals contact first and second labials of each side.

Dorsum with 11 longitudinal rows of enlarged keeled tubercles that are somewhat flat and whose length is less than half the diameter of ear; paravertebral row of enlarged dorsal tubercles with 31 tubercles from nape to base of tail, 16 between axilla and groin; paravertebral rows separated from each other by three to four rows of granules; six rows of tubercles reach nape, and six to base of tail; each tubercle of enlarged dorsal series separated from each other by three to five granules; postanal tubercles small, indistinct; venter with 37 longitudinal and 95 transverse rows of scales.

Dorsal surface of upper arm with flattened, imbricate scales (enlarged tubercles absent); forearm with 9 to 12 enlarged tubercles interspersed among smaller scales; dorsal surface of thigh with 8 to 12 and lower leg with 10 to 20 tubercles scattered among smaller scales; lamellae formula for hand

TABLE 1. Comparison of meristic features of *A. elisae* (n = 38) and *A. griseonotus* (n = 9). Those marked with an asterisk are considered significant.

	<i>A. elisae</i> Mean (range) ± SD (SE)	<i>A. griseonotus</i> Mean (range) ± SD (SE)
* Ventral scales longitudinal	33.6 (28-43) ± 2.8 (0.49)	38.4 (35-41) ± 2.0 (0.67)
* Ventral scales transverse	88.0 (82-100) ± 5.8 (1.1)	96.6 (94-101) ± 2.6 (0.9)
Dorsal tubercles longitudinal rows	11.6 (8-14) ± 1.3 (0.2)	10.8 (10-13) ± 0.9 (0.3)
* Paravertebral tubercles from head to tail	27.3 (22-31) ± 1.8 (0.3)	30.0 (24-33) ± 2.4 (0.8)
Paravertebral tubercles between axilla-groin	15.5 (12-20) ± 1.8 (0.3)	17.2 (15-19) ± 1.3 (0.4)
Granules bordering postmentals	16.2 (13-20) ± 1.9 (0.4)	15.6 (12-17) ± 1.5 (0.5)
Fourth toe lamellae regardless of size	13.1 (11-16) ± 1.3 (0.2)	14.7 (13-16) ± 0.8 (0.3)
Scales between nostril and eye	12.9 (11-16) ± 1.4 (0.2)	11.0 (10-12) ± 1.0 (0.3)
Scales across snout at level of third labial	16.6 (14-19) ± 1.2 (0.2)	16.8 (15-18) ± 1.0 (0.3)
Scales across midorbital region	19.3 (16-23) ± 1.9 (0.3)	20.9 (19-23) ± 1.3 (0.5)

10-10-11-12-11, foot 8-11-13-13-13; claw clearly visible when viewed from below; terminal lamellae composed of two large leaf-like structures, slightly more than three times longer than wide.

Measurements (in mm): snout-vent length 62.0, axilla-groin length 29.6, leg length 32.7, arm length 26.6, tail length 66.0, head length 18.2, head width 11.3, snout length 7.5, eye diameter 4.0, ear diameter 2.2.

Color in alcohol: Ground color ash gray, dorsum with 25 small, dark gray spots scattered evenly over body from nape to base of tail; limbs with faint gray smudges on dorsal surfaces, ventral surfaces of limbs and body uniform dirty white; tail with seven gray to black bands, gray bands proximal, black distal, with white interspaces of equal width; tip of tail tan.

Variation: Little variation was noted in color or color pattern. All specimens have enlarged, transverse rows of scales beneath the tail and all have a laterally compressed tail tip. For variation of meristic characters see discussion on comparisons and associated table.

Comparisons: Basically, *A. griseonotus* is a large gecko with small tubercles and *A. elisae* is small with large tubercles. However, this is somewhat deceptive because *elisae* has small granules surrounding the large tubercles whereas *griseonotus* has large granules surrounding small tubercles. This quantitatively results in an almost

identical number of enlarged tubercles when they are counted in a standard manner. Table 1 compares the meristic data for the two species.

Natural History: Nothing is known regarding the natural history of the new form, other than the fact that Reed collected specimens in the cool, humid environment of limestone crevices of Palegawra Cave in northeastern Iraq (Reed and Marx, 1959: 97-98). Such an environment would be similar to that of the culvert in which Anderson collected *A. elisae* in Khuzestan, Iran (Anderson, 1963: 442). The Street Expedition to Iran in 1962 collected specimens of *A. elisae* in caves in Fars Province. In Baghdad, *A. elisae* is a house gecko, according to Weber (1960: 153). Known food items for *A. elisae* include spiders, ants, beetles, mosquitos, and moths. All of the females of *A. elisae* examined contained ovarian eggs, the largest 2 mm in diameter; all were collected in June, July, August, and late December.

Specimens Examined: *Asaccus elisae* (38). IRAN: 5 km SE Pol-e Abgineh, Fars Province, California Acad. Sci. (CAS) 102520-22, FMNH 141307-09, 141311; Pol-e Abgineh, FMNH 141306; Kuretu, British Mus. Nat. Hist. (BMNH) 1921.3.30.1-3; between Masjed Soleyman and Batvand, CAS 86436-43, 86525-29, 86352, 86339-40; Sar-i-Gach, CAS 86432. IRAQ: Baghdad, FMNH 19695; Arbil, BMNH 1961.1501-03; Jarmo, FMNH 74551; Mosul, FMNH

19696, 19702-03; no specific locality, Museum Comparative Zoology, Harvard Univ., 25905.

Asaccus griseonotus (9). IRAN: 38.5 mi from Shahabad. FMNH 170817-24. IRAQ: Palegawrah Cave, Sulaimaniyah. Liwe. FMNH 74553.

LITERATURE CITED

- Anderson, S. C. 1963. Amphibians and reptiles from Iran. Proc. California Acad. Sci., 31:417-498.
- Arnolds, E. N. 1972. Lizards with northern affinities from the mountains of Oman. Zool. Mededelingen, 47:111-128.
- Dixon, J. R., and A. G. Kluge. 1964. A new gekkonid lizard genus from Australia. Copeia, 1964:139-145.
- Dixon, J. R., and J. C. Kroll. (*in press*). The Madagascaran lizard genus *Paroedura* (Gekkonidae). Copeia.
- Kluge, A. G. 1967. Higher taxonomic categories of gekkonid lizards and their evolution. Bull. Amer. Mus. Nat. Hist., 135:1-59.
- Nikolsky, A. M. 1907. Reptiles et amphibiens recueillis par Mr. N. A. Zarudny en Perse en 1903-1904. Ann. Mus. Zool. Acad. Sci., St. Petersburg, 10:260-301.
- Reed, C. A., and H. Marx. 1959. A herpetological collection from northeastern Iraq. Trans. Kansas Acad. Sci., 62:91-122.
- Weber, N. A. 1960. Some Iraq amphibians and reptiles with notes on their food habits. Copeia, 1960:153-154.
- Wermuth, H. 1965. Liste der rezenten amphibien und reptilien: Gekkonidae, Pygopodidae, Xantusiidae. Das Tierreich, 80:1-246.
- Werner, F. 1895. Ueber eine Sammlung von reptilien aus Persien, Mesopotamien und Arabien. Verh. Zool.-bot. Ges., Wien, 45:14.
- . 1917. Reptilien aus Persien (Provinz Fars). Verh. Zool.-bot. Ges., Wien, 57:191-220.
- Wettstein, O. 1951. Ergebnisse der osterreichischen Iran-Expedition 1947-50, Amphibien und reptilien. Sitz. Osterr. Akad. Wissen. Math.-naturw., 160:427-448.

Accepted for publication February 1, 1973.